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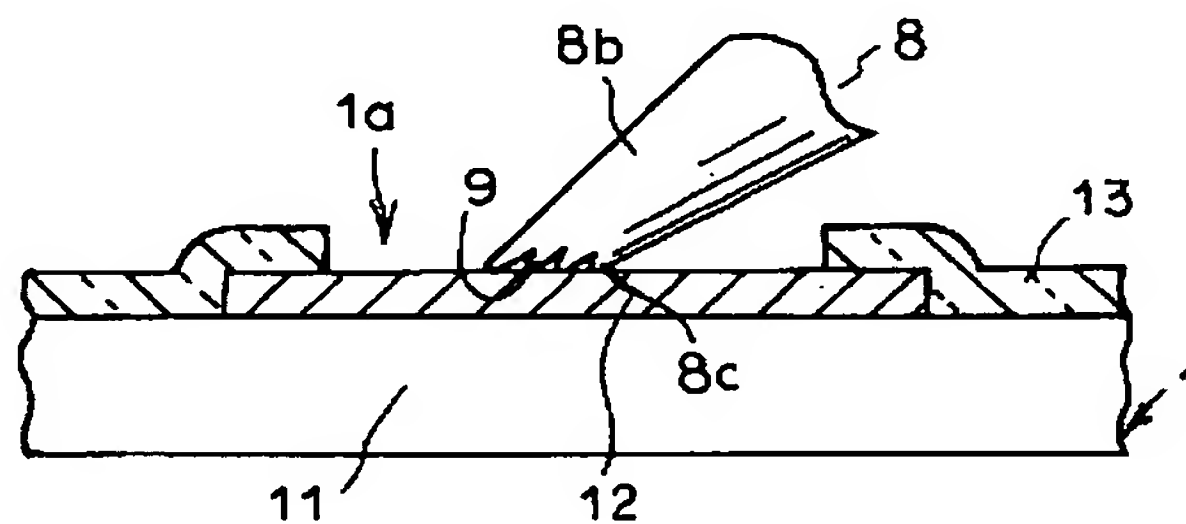
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(54)【発明の名称】 プローブカード

(57)【要約】

【課題】 半導体集積回路装置のパッドに電気接触してテスタによる測定を行うためのプローブ針における、接触抵抗の低減と、良好な電気接触を確保する。

【解決手段】 半導体集積回路装置1に設けられたパッド1aに対して電気接触され、前記半導体集積回路装置とテスタとを電気接続するためのプローブ針8を備えるプローブカードにおいて、前記プローブ針8の先端部8bが複数の突部9で構成され。この突部9は、先端が鋭角な三角状の断面形状をした格子状の突部、あるいは、先端が鋭角な三角状の断面形状をした錘型の突部とし構成される。複数の突部9のそれぞれにおいてパッド1aに電気接触されるため、接触面積を増大して、接触抵抗を低減することが可能となる。また、複数の突部9がそれぞれパッド1aの表面の酸化膜をつき破るため、好適な電気接触が可能となる。



1 : 1 C

1 a : パッド

1 1 : 基板

1 2 : 導電膜

1 3 : 保護膜

8 : プローブ針

9 : 突部

【特許請求の範囲】

【請求項 1】 半導体集積回路装置に設けられたパッドに対して電気接触され、前記半導体集積回路装置とテストとを電気接続するためのプローブ針を備えるプローブカードにおいて、前記プローブ針の先端部が複数の突部で構成されていることを特徴とするプローブカード。

【請求項 2】 前記突部は、先端が鋭角な三角状の断面形状をした格子状の突部である請求項 1 に記載のプローブカード。

【請求項 3】 前記突部は、先端が鋭角な三角状の断面形状をした錘型の突部である請求項 1 に記載のプローブカード。

【請求項 4】 前記突部は断面形状が鋸歯状である請求項 2 または 3 に記載のプローブカード。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、半導体装置をウェハ状態で評価する際に用いるプローブカードに関し、特にウェハのボンディングパッドに接触するプローブ針の先端部の形状の改良に係るものである。

【0002】

【従来の技術】一般に、半導体集積回路装置（IC）の製造過程での半導体ウェハ上に形成される半導体装置の電気的特性等を測定するために、いわゆるテストと呼ばれる検査装置が用いられる。このテストでは、IC のパッド（電極）と、テスト本体を電氣的に接続するためのボードとしてのプローブカードが設けられており、このプローブカードに備えらるニードル、すなわちプローブ針を IC のパッドに接触して IC に対する電気接続を行うように構成される。このプローブカードは、前記した

プローブ針と、複数本のプローブ針を固定支持する固定ボードとで構成されている。

【0003】従来のプローブカードにおけるプローブ針先端部の拡大図及び IC のパッドとの接触状態の断面図をそれぞれ図 4（a）、（b）に示す。従来のプローブカードは、プローブ針 8 の先端部 8 b が尖っており、また、円錐状の形状をしている。そして、IC 1 のシリコン基板 1 1 の表面に形成されて保護膜 1 3 で周囲を覆われた導電膜 1 2 からなるパッド 1 a の表面にそのプローブ針 8 の先端部 8 b が接触され、このパッド 1 a を通して電気接続が行われる。このようなプローブカードとしては、例えば、特開昭 6 2 - 2 9 5 4 2 6 号公報、特開平 4 - 1 9 9 8 3 6 号公報に記載のものがある。

【0004】しかしながら、このようなプローブカードでは、プローブ針 8 の先端部 8 b が尖っているために、パッド 1 a との接触面積が小さく、接触抵抗が大きくなり易い。このため、微弱電流を通流するような場合には、その接触抵抗によって電流が低下され、好適な測定が難しくなるという問題がある。このため、従来では、図 5（a）または図 6（a）に示すように、プローブ針

8、8 A の先端を平面に形成し、この平面状の先端面 8 c をパッド 1 a に接触させる構成が提案されている。このプローブ針 8、8 A では、図 5（b）または図 6

（b）に示すように、パッド 1 a とプローブ針 8 との接触面積が増大でき、前記した接触抵抗を低減することが可能となる。このようなプローブカードとしては、例えば、特開昭 6 2 - 2 9 5 4 2 6 号公報、特開平 4 - 1 9 9 8 3 6 号公報に記載のものがある。

【0005】

【発明が解決しようとする課題】しかしながら、このようにプローブ針の先端を平面に形成した構成では、プローブ針 8、8 A が正しい角度でパッド 1 a の表面に接触したときには良いが、その角度にずれが生じたような場合には、プローブ針 8、8 A の先端面 8 c が正しくパッド 1 a の表面に接触しなくなり、結果として両者が線または点接触状態となり、前記した接触面積の増大と接触抵抗の低減の各効果を得ることができない場合がある。また、一般にこの種のプローブ針は、パッド表面に発生する 1 0 0 Å 程度の薄い酸化膜をつき破って電気接続を行っており、そのためにプローブ針の先端を尖らせる構成ともされているが、前記したように平面に形成したときには、この薄い酸化膜をつき破ることができなくなり、結果として好適な電気接触ができなくなるという問題が生じることになる。

【0006】本発明の目的は、プローブ針とパッドとの接触抵抗を低減し、両者の好適な電気接触を可能にして、測定の正確性が向上し、テストの信頼性を向上することを可能にしたプローブカードを提供することにある。

【0007】

【課題を解決するための手段】本発明のプローブカードは、IC のパッドに対して電気接触されるプローブ針の先端部が複数の突部で構成されていることを特徴とする。ここで、前記突部は、先端が鋭角な三角状の断面形状をした格子状の突部として、あるいは、先端が鋭角な三角状の断面形状をした錘型の突部として構成される。また、各突部は、その断面形状が鋸歯状であることが好ましい。

【0008】複数の突部のそれぞれにおいてパッドに電気接触されるため、接触面積を増大して、接触抵抗を低減することか可能となる。また、複数の突部がそれぞれパッド表面の酸化膜をつき破るため、好適な電気接触が可能となる。

【0009】

【発明の実施の形態】次に、本発明の実施形態について図面を参照して説明する。図 1 は本発明のプローブカードを備えるテストの主要部の概略構成を示す図である。ステージ 2 にはテストされる IC、ここではシリコンウェハ 1 が載置され、前記ステージ 2 の下側に設けられた上下駆動機構 3 によって上下移動可能に支持される。ま

た、前記ステージ 2 の上方には固定ボード 4 が水平に配置され、図外のテスト機構に支持されている。前記固定ボード 4 にはプローブカード 5 が支持される。このプローブカード 5 は、絶縁基板 6 に矩形窓 6 a が開口されるとともに、その表面には所要の回路パターン 7 が形成されており、図外のテスト回路に電気接続されている。そして、前記矩形窓 6 a 内には多数本のプローブ針 8 が配設されており、各プローブ針 8 はその基端部 8 a が前記回路パターン 7 に接続固定され、その先端部 8 b が前記矩形窓 6 a を通して下方に向けて突出されている。このため、ステージ 2 を上昇させることにより、I C 1 に設けられているパッド 1 a に前記各プローブ針 8 の先端部 8 b を接触させ、このプローブ針 8 及び回路パターン 7 を介して前記 I C 1 とテスト回路とを電気接続し、所要のテストが実行されるように構成される。

【0010】図 2 (a) は前記プローブ針 8 の先端部 8 b の拡大斜視図である。このプローブ針 8 の先端部 8 b は全体形状が円錐型に形成されているが、その先端面 8 c はプローブ針の軸方向に対して傾斜した状態の面に形成されるとともに、この先端面には先端が鋭角で断面形状が三角形をした複数の突部 9 が格子状に配列形成されている。あるいは、図 2 (b) に示すように、前記先端面 8 c には、先端が鋭角な複数の微小な円錐型の突起 9 A を規則的にあるいは不規則に配列した構成としてもよい。なお、ここでは前記先端面 8 c は直径は $80 \mu\phi$ 以下の円形ないし楕円形として形成されている。また、図 2 (b) の突部 9 A は、角錐型であってもよい。

【0011】図 3 は前記したプローブカード 5 により I C 1 のテストを行っている状態の要部の拡大断面図である。前記 I C 1 は、シリコンウェハの基板 1 1 の表面に形成された所要パターンの導電膜 1 2 は保護膜 1 3 によって被覆されており、この保護膜 1 3 に設けられた開口に露呈されて前記導電膜 1 2 によって前記パッド 1 a が形成されている。そして、図 1 に示したように、ステージ 2 が上昇されてプローブ針 8 の先端にパッド 1 a が当接されることにより、図 3 に示したようなプローブ針 8 とパッド 1 a との電気接触が行われる。このとき、プローブ針 8 の先端面 8 c には、先端が鋭角な突部 9 が配設されているため、これらの突部 9 の先端においてパッド 1 a の表面に発生している図外の酸化膜をつき破り、その上でパッド 1 a の導電膜 1 2 に電気接触されることになる。したがって、プローブ針 8 とパッド 1 a とは、複数の突部 9 においてそれぞれ電気接触されるため、1 つの尖った先端部で接触される従来構成に比較して接触面積を増大し、接触抵抗を低減することが可能となる。また、その一方で複数の突部 9 の各先端でパッド表面の酸化膜をつき破るため、良好な電気接触を得ることができる。

【0012】特に、図 2 (a) の構成のプローブ針 8 では、突部 9 が格子状に形成されているため、各突部 9 と

パッド 1 a は線接触状態とされるため、図 2 (b) の構成のそれぞれが独立した突起状の突部 9 A の構成よりも接触抵抗を低減することができる。また、一方で、図 2 (b) の構成では、各突部 9 A がそれぞれ尖っているために、各突部 9 A での酸化膜のつき破り効果が高く、各突部 9 A での電気接触が極めて有効なものとなる。

【0013】なお、前記プローブ針 8 の先端面 8 c は、なるべくパッド 1 a の表面と平行になるように形成し、かつ前記突部 9、9 A はそれぞれその中心線がこの先端面 8 c と垂直な方向、すなわちプローブ針 8 とパッド 1 a とが接触される方向に突出されるように構成することが好ましい。この結果、各突部 9、9 A の断面形状は、前記先端面 8 c に対して片側に偏位された鋸歯状に形成されることが好ましい。これにより、各突部 9、9 A はパッド 1 a の表面に対して垂直方向に当接されることになり、酸化膜をより有効につき破り、好適な電気接触が可能となる。

【0014】なお、前記実施形態は本発明の一例を示したものであり、特にプローブ針の先端面に配設される突部の形状は配列形態は前記した構成以外に種々の構成が適用可能である。

【0015】

【発明の効果】以上説明したように本発明は、プローブ針の先端部が複数の突部で構成されているので、複数の突部のそれぞれにおいてパッドに電気接触されるため、接触面積を増大して、接触抵抗を低減することが可能となる。また、複数の突部がそれぞれパッド表面の酸化膜をつき破るため、好適な電気接触が可能となる。この場合、突部の形状として、先端が鋭角な三角状の断面形状をした格子状の突部として、あるいは、先端が鋭角な三角状の断面形状をした錐型の突部として形成することにより、前記酸化膜をより好適につき破ることが可能となり、さらに好適な電気接触状態を得ることができる。特に、突部の断面形状が鋸歯状であることにより、プローブ針がパッドに接触する際に各突部に加えられる当接力を有効に利用して前記酸化膜のつき破りを行うことが可能となる。

【図面の簡単な説明】

【図 1】本発明のプローブカードが適用されるテストの要部の概略構成図である。

【図 2】本発明にかかるプローブ針の先端部の拡大斜視図である。

【図 3】図 2 のプローブ針とパッドとの接触状態を示す断面図である。

【図 4】従来のプローブカードのプローブ針の先端部の斜視図とその接触状態の断面図である。

【図 5】従来の改善されたプローブカードにおけるプローブ針の先端部の斜視図とその接触状態の断面図である。

【図 6】従来の他の改善されたプローブカードにおける

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プローブ針の先端部の斜視図とその接触状態の断面図である。

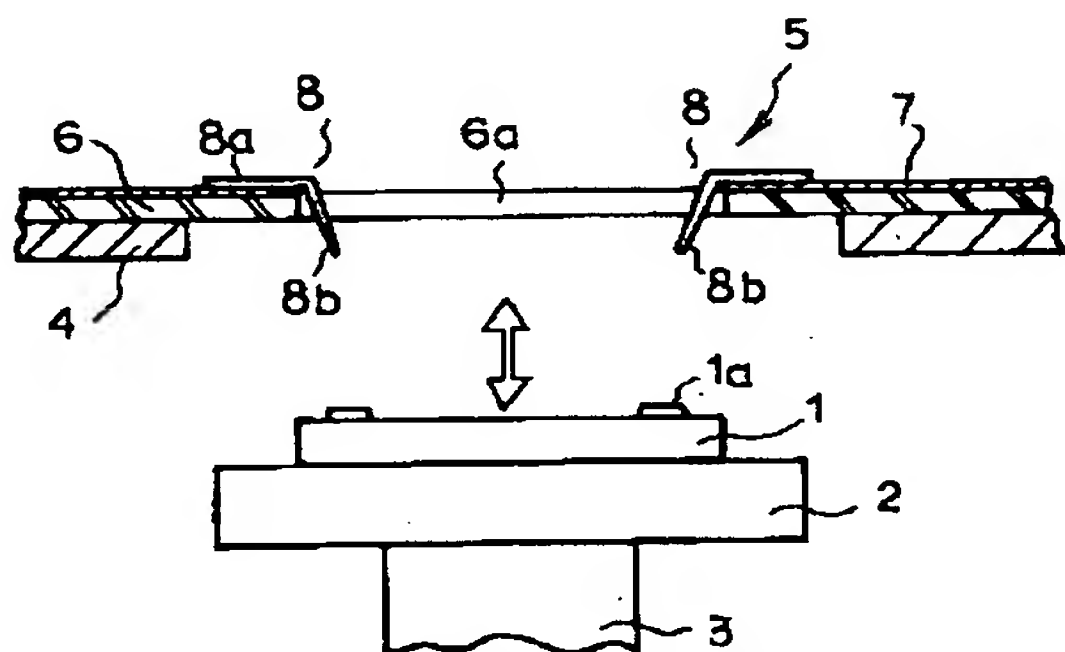
【符号の説明】

- 1 IC
2 ステージ
3 上下駆動機構
5 プローブカード

- * 6 絶縁基板
7 回路パターン
8 プローブ針
8b 先端部
8c 先端面
9, 9A 突部

*

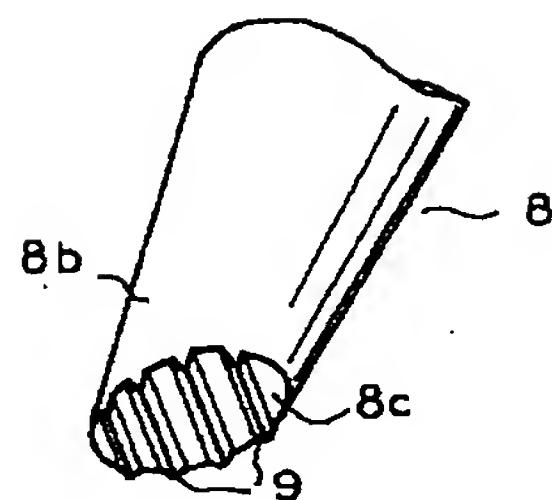
【図1】



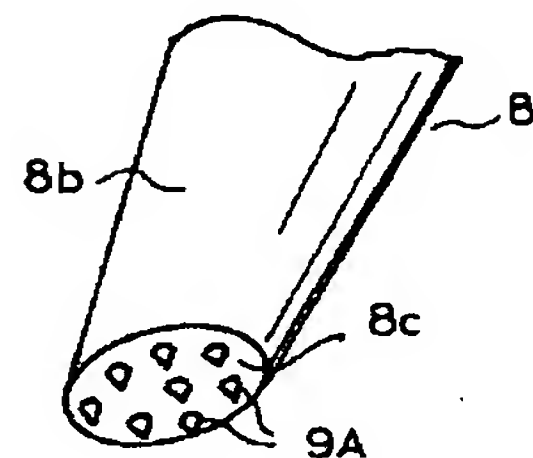
- 1: IC (半導体集積回路装置)
1a: パッド
2: ステージ
3: 上下駆動機構
4: 固定ボード
5: プローブカード
6: 絶縁基板
7: 回路パターン
8: プローブ針
8b: 先端部

【図2】

(a)

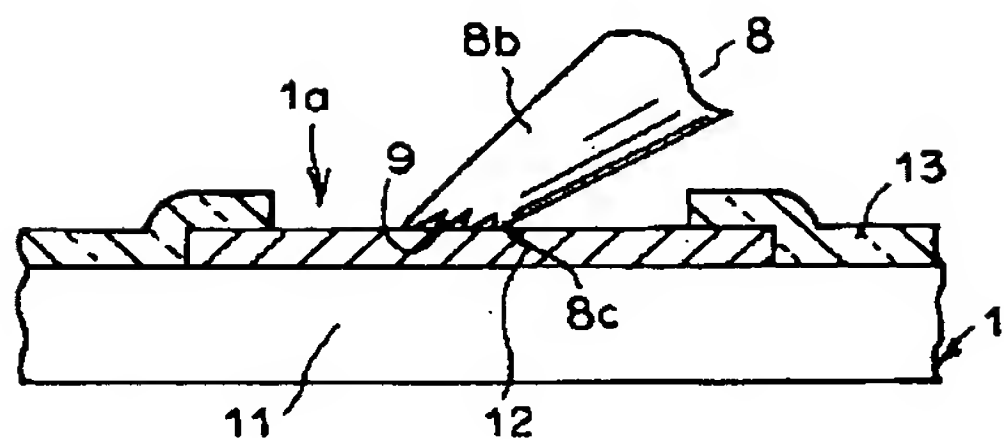


(b)



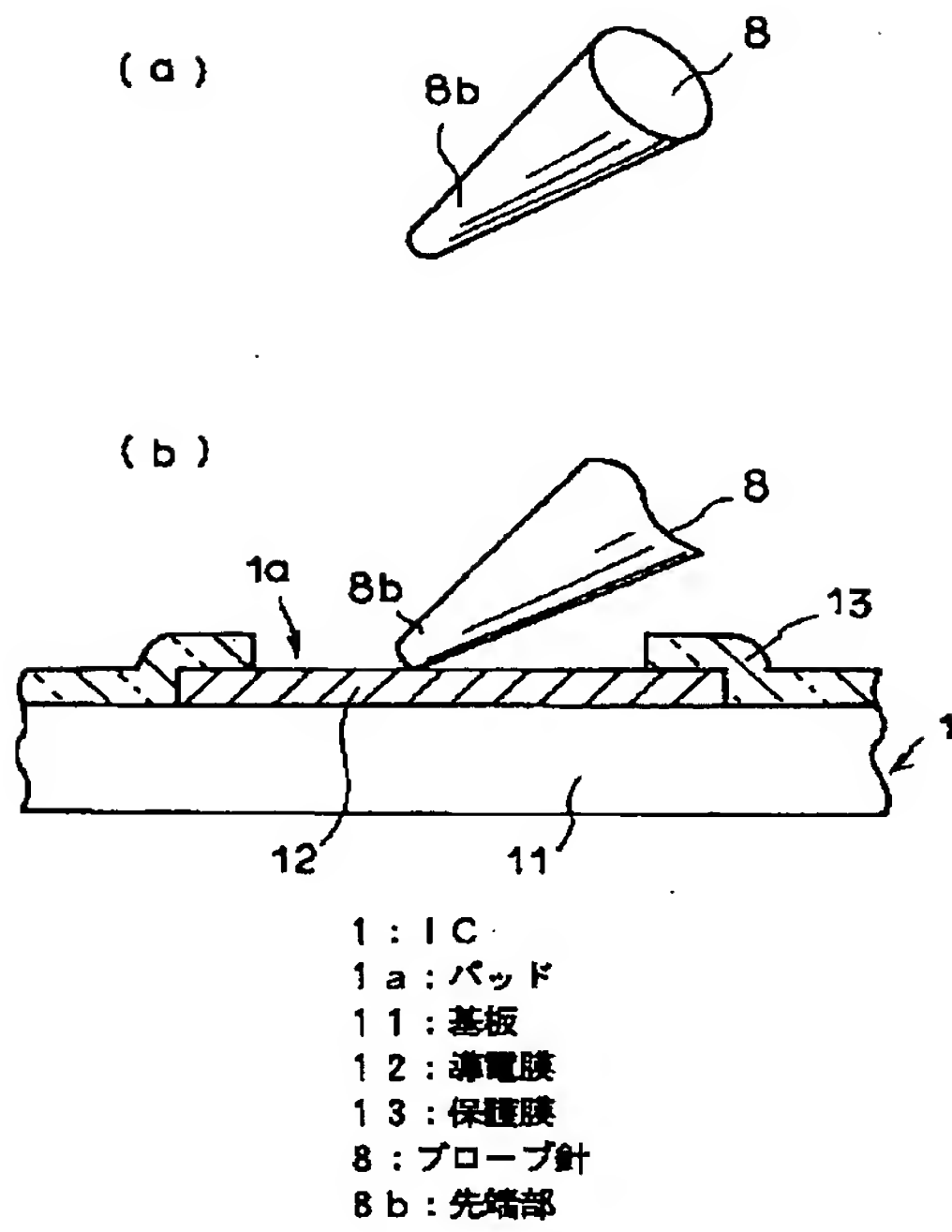
- 8: プローブ針
8b: 先端部
8c: 先端面
9: 突部 (格子状)
9A: 突部 (円錐状)

【図3】

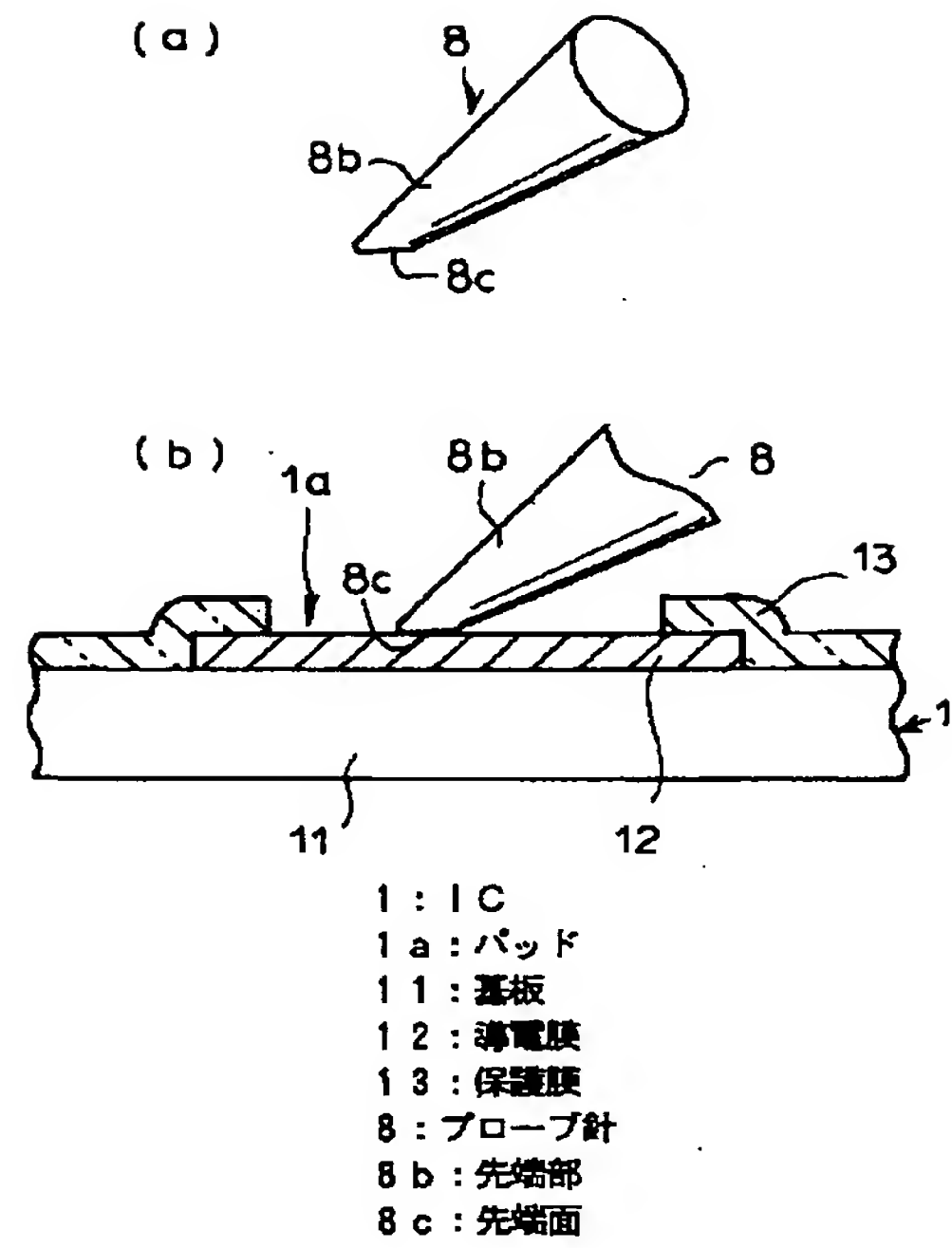


- 1: IC
1a: パッド
11: 基板
12: 導電膜
13: 保護膜
8: プローブ針
9: 突部

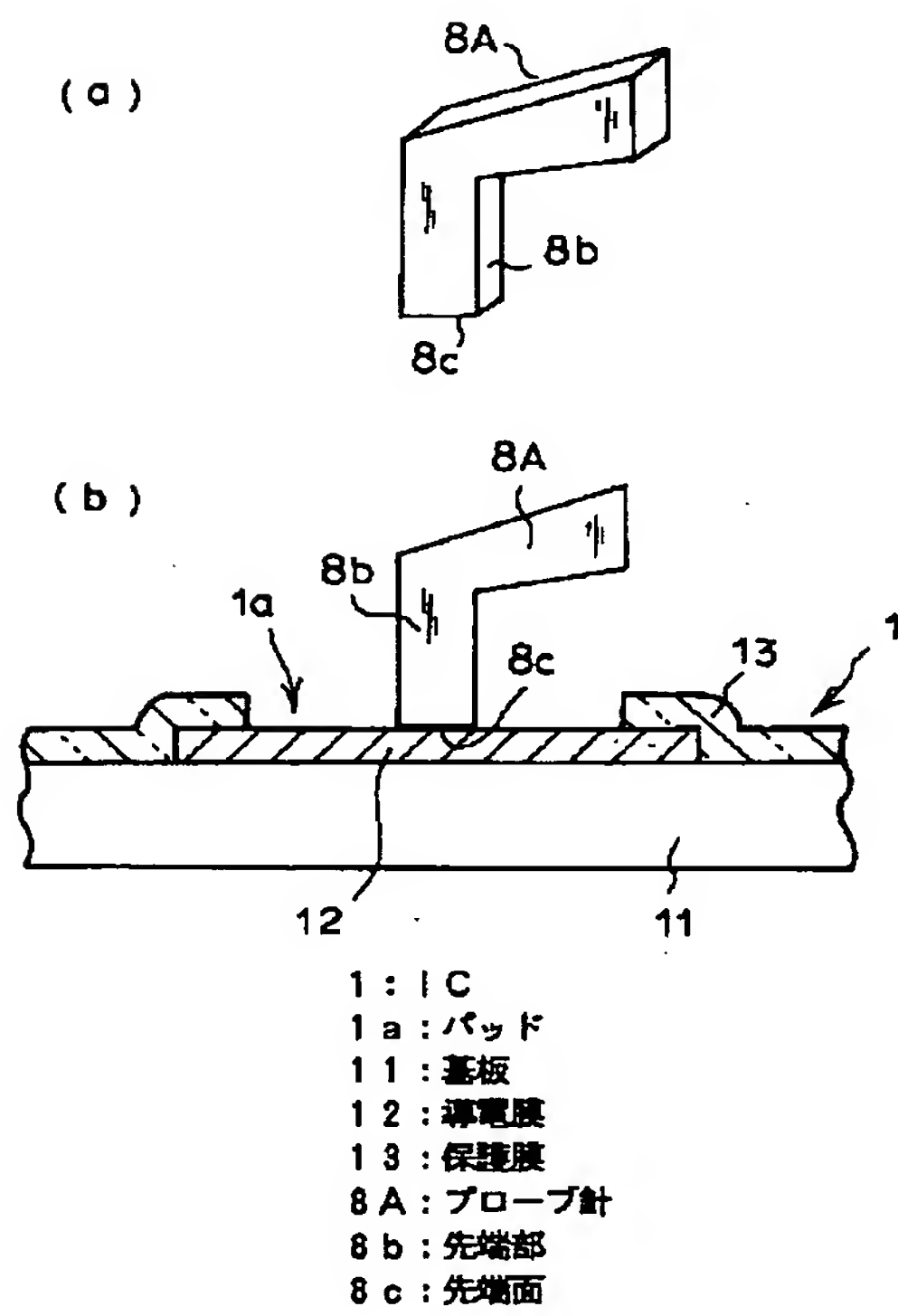
【図4】



【図5】



【図6】



PATENT ABSTRACTS OF JAPAN

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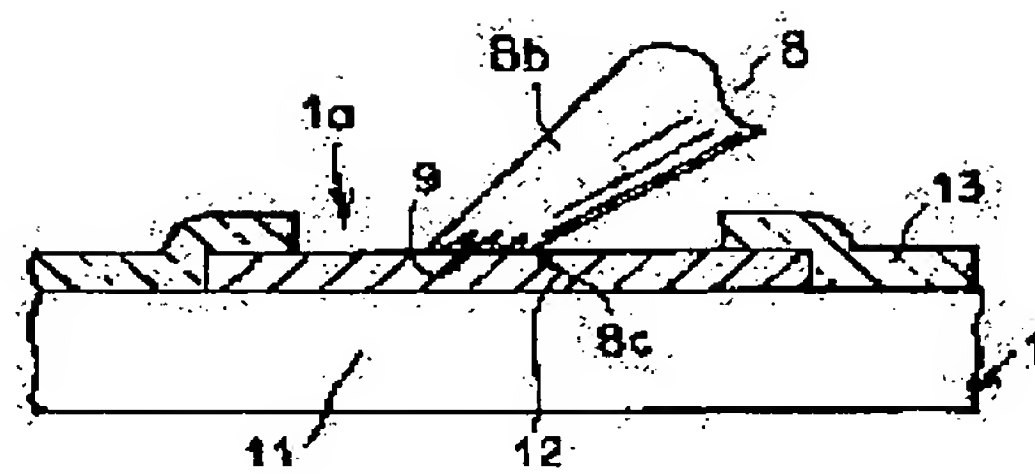
(72)Inventor : FUKUSHIMA YOSHIHIKO

(54) PROBE CARD

(57)Abstract:

PROBLEM TO BE SOLVED: To reduce the contact resistance, and to secure a good electrical contact in a probe needle which is electrically brought into contact with the pad of a semiconductor integrated circuit device for carrying out the measurement by means of a tester.

SOLUTION: In a probe card provided with a probe needle 8 which is electrically brought into contact with the pad 1c that has been provided to a semiconductor integrated circuit device 1 for electrically connecting the semiconductor integrated circuit device with a tester; the end part 8b of the probe needle 8 is made up of a plurality of projected parts 9, each of which is made up in a lattice-shaped projection whose end has an acute triangular shape in section, or in a weight-shaped projection whose end has an acute triangular shape in section. Since a plurality of projections 9 are electrically brought into contact with the pad 1a respectively, the contact surfaces are increased, and the contact resistance can be reduced. Further, since a plurality of projections 9 break through the oxide film on the surface of time pad 1a respectively, a proper electrical contact can be enabled.



LEGAL STATUS

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[Date of sending the examiner's decision of rejection] 29.08.2000

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection] 2000-15425

[Date of requesting appeal against examiner's decision of rejection] 28.09.2000

[Date of extinction of right]

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CLAIMS

[Claim(s)]

[Claim 1] The probe card characterized by the point of said probe needle consisting of two or more projected parts in a probe card equipped with the probe needle for being contacted electrically to the pad prepared in semiconductor integrated circuit equipment, and carrying out electrical connection of said semiconductor integrated circuit equipment and circuit tester.

[Claim 2] Said projected part is a probe card according to claim 1 which is the projected part of the shape of a grid which carried out the acute angle tip cross-section configuration of 3 corniform.

[Claim 3] Said projected part is a probe card according to claim 1 which is the spindle type projected part which carried out the acute angle tip cross-section configuration of 3 corniform.

[Claim 4] Said projected part is a probe card according to claim 2 or 3 whose cross-section configuration is serrate.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to amelioration of the configuration of the point of a probe needle of contacting especially the bonding pad of a wafer, about the probe card used in case a wafer condition estimates a semiconductor device.

[0002]

[Description of the Prior Art] In order to measure the electrical characteristics of the semiconductor device formed on the semi-conductor wafer in the manufacture process of semiconductor integrated circuit equipment (IC) etc. generally, the test equipment called the so-called circuit tester is used. The probe card as a board for connecting a circuit tester body with the pad (electrode) of IC electrically is prepared, and it consists of this circuit tester so that the pad of IC may be contacted in a ***** needle, i.e., a probe needle, in preparation for this probe card and electrical connection to IC may be performed. This probe card consists of fixed boards which carry out fixed support of the above mentioned probe needle and two or more probe needles.

[0003] The enlarged drawing of the probe needle point in the conventional probe card and the sectional view of a contact condition with the pad of IC are shown in drawing 4 (a) and (b), respectively. Point 8b of the probe needle 8 is sharp, and the conventional probe card is carrying out the conic configuration. And point 8b of that probe needle 8 is contacted on the front face of pad 1a which consists of electric conduction film 12 which it was formed [film] in the front face of the silicon substrate 11 of IC1, and had the perimeter covered by the protective coat 13, and electrical connection is performed through this pad 1a. As such a probe card, the thing of a publication is in JP,62-295426,A and JP,4-199836,A, for example.

[0004] However, in such a probe card, since point 8b of the probe needle 8 is sharp, a touch area with pad 1a is small, and contact resistance tends to become large. For this reason, in carrying out conduction of the feeble current, a current falls by that contact resistance and there is a problem that suitable measurement becomes difficult. For this reason, in the former, as shown in drawing 5 (a) or drawing 6 (a), the tip of the probe needles 8 and 8A is formed in a flat surface, and the configuration in which this plane apical surface 8c is contacted to pad 1a is proposed. With these probe needles 8 and 8A, as shown in drawing 5 (b) or drawing 6 (b), it becomes possible to reduce the contact resistance which could increase and described above the touch area of pad 1a and the probe needle 8. As such a probe card, the thing of a publication is in JP,62-295426,A and JP,4-199836,A, for example.

[0005]

[Problem(s) to be Solved by the Invention] however, with the configuration formed in the flat surface, the tip of a probe needle in this way When the probe needles 8 and 8A contact the front face of pad 1a at a right include angle, it is good, but when a gap arises at the include angle Apical surface 8c of the probe needles 8 and 8A may be able to stop being able to contact the front face of pad 1a correctly, both may be unable to be in a line or a point contact condition as a result, and the above mentioned increase of a touch area and each effectiveness of reduction of contact resistance may be unable to be acquired. moreover, although this kind of probe needle

is generally considered also as the configuration which attaches and tears the about 100Å thin oxide film generated on a pad front face, and is performing electrical connection, therefore sharpens the tip of a probe needle, as carried out, when [said] it forms in a flat surface, in question [which **s with it becoming impossible to attach and tear this thin oxide film, and ***** suitable / ***** / effect / becoming impossible] ***** [*****] — **.

[0006] The purpose of this invention is to offer the probe card which reduced the contact resistance of a probe needle and a pad, enabled both suitable electric contact, and made it possible for the accuracy of measurement to improve and to improve the dependability of a test.

[0007]

[Means for Solving the Problem] The probe card of this invention is characterized by the point of the probe needle contacted electrically to the pad of IC consisting of two or more projected parts. Here, said projected part is constituted as the projected part of the shape of a grid which carried out the acute angle tip cross-section configuration of 3 corniform, or a spindle type projected part which carried out the acute angle tip cross-section configuration of 3 corniform. Moreover, as for each projected part, it is desirable that the cross-section configuration is serrate.

[0008] Since it is contacted electrically by the pad in each of two or more projected parts, it becomes [increasing a touch area and reducing contact resistance or] possible. Moreover, since two or more projected parts attach and tear the oxide film on the front face of a pad, respectively, suitable electric contact is attained.

[0009]

[Embodiment of the Invention] Next, the operation gestalt of this invention is explained with reference to a drawing. Drawing 1 is drawing showing the outline configuration of the principal part of a circuit tester equipped with the probe card of this invention. the vertical drive 3 which the silicon wafer 1 was laid in the stage 2 here [IC and here] where it is tested, and was formed in said stage 2 bottom — the upper and lower sides — it is supported movable. Moreover, above said stage 2, the fixed board 4 is arranged horizontally, and it is supported by the test mechanization outside drawing. A probe card 5 is supported by said fixed board 4. While opening of the rectangular window 6a is carried out to an insulating substrate 6, the necessary circuit pattern 7 is formed in that front face, and electrical connection of this probe card 5 is carried out to the test circuit outside drawing. And many probe needles 8 of a book are arranged in said rectangular window 6a, connection immobilization of the end face section 8a is carried out at said circuit pattern 7, the point 8b turns each probe needle 8 caudad through said rectangular window 6a, and it is projected. For this reason, by raising a stage 2, point 8b of each of said probe needle 8 is contacted to pad 1a prepared in IC1, and electrical connection of said IC1 and test circuit is carried out through this probe needle 8 and the circuit pattern 7, and it is constituted so that a necessary test may be performed.

[0010] Drawing 2 (a) is the expansion perspective view of point 8b of said probe needle 8.

Although, as for point 8b of this probe needle 8, the whole configuration is formed in the cone mold, while that apical surface 8c is formed in the field in the condition of having inclined to the shaft orientations of a probe needle, array formation of two or more projected parts 9 to which the cross-section configuration made [the tip] the triangle this apical surface by the acute angle is carried out at the shape of a grid. Or as shown in drawing 2 (b), it is good for said apical surface 8c also as a configuration whose tip is an acute angle and which arranged regularly or irregularly two or more projection 9A of the minute cone mold of an individual. In addition, the diameter is formed for said apical surface 8c as the round shape thru/or ellipse form below 80microphi here. Moreover, projected part 9A of drawing 2 (b) may be a **** type.

[0011] Drawing 3 is the expanded sectional view of the important section in the condition of testing IC1 with the above mentioned probe card 5. The electric conduction film 12 of the necessary pattern formed in the front face of the substrate 11 of a silicon wafer is covered with the protective coat 13, said IC1 is exposed by opening prepared in this protective coat 13, and said pad 1a is formed with said electric conduction film 12. And as shown in drawing 1, when a stage 2 goes up and pad 1a is contacted at the tip of the probe needle 8, electric contact to the

probe needle 8 as shown in drawing 3 , and pad 1a is performed. Since the acute angle tip projected part 9 is arranged in apical surface 8c of the probe needle 8 at this time, the oxide film outside drawing generated on the front face of pad 1a in the tip of these projected parts 9 will be attached and torn, and it will be contacted electrically by the electric conduction film 12 of pad 1a on it. Therefore, since the probe needle 8 and pad 1a are contacted electrically in two or more projected parts 9, respectively, they increase a touch area conventionally which is contacted by one sharp point as compared with a configuration, and become possible [reducing contact resistance]. Moreover, since the oxide film on the front face of a pad is attached and torn at each tip of two or more projected parts 9 by one of these, good electric contact can be obtained.

[0012] Especially, with the probe needle 8 of the configuration of drawing 2 (a), since the projected part 9 is formed in the shape of a grid, since each projected part 9 and pad 1a are made into a line contact condition, they can reduce contact resistance rather than the configuration of projected part 9A of the letter of a projection which each of the configuration of drawing 2 (b) became independent of. Moreover, by one side, with the configuration of drawing 2 (b), since each projected part 9A is sharp, respectively, the oxide film in each projected part 9A sticks, and it breaks, and effectiveness is high and becomes what has the very effective electric contact by each projected part 9A.

[0013] in addition, form apical surface 8c of said probe needle 8 to become the front face of pad 1a, and parallel if possible, and excite said projected parts 9 and 9A — it is desirable to constitute so that it may be projected and carried out in the direction where the center line of **** is perpendicular to this apical surface 8c, i.e., the direction in which the probe needle 8 and pad 1a are contacted. Consequently, as for the cross-section configuration of each projected parts 9 and 9A, it is desirable to be formed in serrate [which was biased by one side to said apical surface 8c]. Thereby, each projected parts 9 and 9A will be perpendicularly contacted to the front face of pad 1a, attach an oxide film more effectively, and tear it, and the suitable electric contact of them is attained.

[0014] In addition, said operation gestalt can show an example of this invention, and the configuration of the projected part arranged especially in the apical surface of a probe needle can apply various configurations in addition to the configuration which described the array gestalt above.

[0015]

[Effect of the Invention] As explained above, since the point of a probe needle consists of two or more projected parts and this invention is contacted electrically by the pad in each of two or more projected parts, it increases a touch area and becomes possible [reducing contact resistance]. Moreover, since two or more projected parts attach and tear the oxide film on the front face of a pad, respectively, suitable electric contact is attained. In this case, by forming as the projected part of the shape of a grid which carried out the acute angle tip cross-section configuration of 3 corniform as a configuration of a projected part, or a spindle type projected part which carried out the acute angle tip cross-section configuration of 3 corniform, it becomes possible to attach said oxide film more suitably and to tear it, and a still more suitable electric contact condition can be acquired. Especially, when the cross-section configuration of a projected part is serrate, in case a probe needle contacts a pad, it becomes possible for said oxide film to stick using effectively the contact force applied to each projected part, and to perform ****.

[Translation done.]

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TECHNICAL FIELD

[Field of the Invention] This invention relates to amelioration of the configuration of the point of a probe needle of contacting especially the bonding pad of a wafer, about the probe card used in case a wafer condition estimates a semiconductor device.

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PRIOR ART

[Description of the Prior Art] In order to measure the electrical characteristics of the semiconductor device formed on the semi-conductor wafer in the manufacture process of semiconductor integrated circuit equipment (IC) etc. generally, the test equipment called the so-called circuit tester is used. The probe card as a board for connecting a circuit tester body with the pad (electrode) of IC electrically is prepared, and it consists of this circuit tester so that the pad of IC may be contacted in a ***** needle, i.e., a probe needle, in preparation for this probe card and electrical connection to IC may be performed. This probe card consists of fixed boards which carry out fixed support of the above mentioned probe needle and two or more probe needles.

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EFFECT OF THE INVENTION

[Effect of the Invention] As explained above, since the point of a probe needle consists of two or more projected parts and this invention is contacted electrically by the pad in each of two or more projected parts, it increases a touch area and becomes possible [reducing contact resistance]. Moreover, since two or more projected parts attach and tear the oxide film on the front face of a pad, respectively, suitable electric contact is attained. In this case, by forming as the projected part of the shape of a grid which carried out the acute angle tip cross-section configuration of 3 corniform as a configuration of a projected part, or a spindle type projected part which carried out the acute angle tip cross-section configuration of 3 corniform, it becomes possible to attach said oxide film more suitably and to tear it, and a still more suitable electric contact condition can be acquired. Especially, when the cross-section configuration of a projected part is serrate, in case a probe needle contacts a pad, it becomes possible for said oxide film to stick using effectively the contact force applied to each projected part, and to perform ****.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] however, with the configuration formed in the flat surface, the tip of a probe needle in this way When the probe needles 8 and 8A contact the front face of pad 1a at a right include angle, it is good, but when a gap arises at the include angle Apical surface 8c of the probe needles 8 and 8A may be able to stop being able to contact the front face of pad 1a correctly, both may be unable to be in a line or a point contact condition as a result, and the above mentioned increase of a touch area and each effectiveness of reduction of contact resistance may be unable to be acquired. moreover, although this kind of probe needle is generally considered also as the configuration which attaches and tears the about 100A thin oxide film generated on a pad front face, and is performing electrical connection, therefore sharpens the tip of a probe needle, as carried out, when [said] it forms in a flat surface, in question [which **s with it becoming impossible to attach and tear this thin oxide film, and ***** suitable / ***** / effect / becoming impossible] ****s [*****] -- **.

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MEANS

[Means for Solving the Problem] The probe card of this invention is characterized by the point of the probe needle contacted electrically to the pad of IC consisting of two or more projected parts. Here, said projected part is constituted as the projected part of the shape of a grid which carried out the acute angle tip cross-section configuration of 3 corniform, or a spindle type projected part which carried out the acute angle tip cross-section configuration of 3 corniform. Moreover, as for each projected part, it is desirable that the cross-section configuration is serrate.

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[0009]

[Embodiment of the Invention] Next, the operation gestalt of this invention is explained with reference to a drawing. Drawing 1 is drawing showing the outline configuration of the principal part of a circuit tester equipped with the probe card of this invention. the vertical drive 3 which the silicon wafer 1 was laid in the stage 2 here [IC and here] where it is tested, and was formed in said stage 2 bottom -- the upper and lower sides -- it is supported movable. Moreover, above said stage 2, the fixed board 4 is arranged horizontally, and it is supported by the test mechanization outside drawing. A probe card 5 is supported by said fixed board 4. While opening of the rectangular window 6a is carried out to an insulating substrate 6, the necessary circuit pattern 7 is formed in that front face, and electrical connection of this probe card 5 is carried out to the test circuit outside drawing. And many probe needles 8 of a book are arranged in said rectangular window 6a, connection immobilization of the end face section 8a is carried out at said circuit pattern 7, the point 8b turns each probe needle 8 caudad through said rectangular window 6a, and it is projected. For this reason, by raising a stage 2, point 8b of each of said probe needle 8 is contacted to pad 1a prepared in IC1, and electrical connection of said IC1 and test circuit is carried out through this probe needle 8 and the circuit pattern 7, and it is constituted so that a necessary test may be performed.

[0010] Drawing 2 (a) is the expansion perspective view of point 8b of said probe needle 8.

Although, as for point 8b of this probe needle 8, the whole configuration is formed in the cone mold, while that apical surface 8c is formed in the field in the condition of having inclined to the shaft orientations of a probe needle, array formation of two or more projected parts 9 to which the cross-section configuration made [the tip] the triangle this apical surface by the acute angle is carried out at the shape of a grid. Or as shown in drawing 2 (b), it is good for said apical surface 8c also as a configuration whose tip is an acute angle and which arranged regularly or irregularly two or more projection 9A of the minute cone mold of an individual. In addition, the diameter is formed for said apical surface 8c as the round shape thru/or ellipse form below 80microphi here. Moreover, projected part 9A of drawing 2 (b) may be a **** type.

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the protective coat 13, said IC1 is exposed by opening prepared in this protective coat 13, and said pad 1a is formed with said electric conduction film 12. And as shown in drawing 1, when a stage 2 goes up and pad 1a is contacted at the tip of the probe needle 8, electric contact to the probe needle 8 as shown in drawing 3, and pad 1a is performed. Since the acute angle tip projected part 9 is arranged in apical surface 8c of the probe needle 8 at this time, the oxide film outside drawing generated on the front face of pad 1a in the tip of these projected parts 9 will be attached and torn, and it will be contacted electrically by the electric conduction film 12 of pad 1a on it. Therefore, since the probe needle 8 and pad 1a are contacted electrically in two or more projected parts 9, respectively, they increase a touch area conventionally which is contacted by one sharp point as compared with a configuration, and become possible [reducing contact resistance]. Moreover, since the oxide film on the front face of a pad is attached and torn at each tip of two or more projected parts 9 by one of these, good electric contact can be obtained.

[0012] Especially, with the probe needle 8 of the configuration of drawing 2 (a), since the projected part 9 is formed in the shape of a grid, since each projected part 9 and pad 1a are made into a line contact condition, they can reduce contact resistance rather than the configuration of projected part 9A of the letter of a projection which each of the configuration of drawing 2 (b) became independent of. Moreover, by one side, with the configuration of drawing 2 (b), since each projected part 9A is sharp, respectively, the oxide film in each projected part 9A sticks, and it breaks, and effectiveness is high and becomes what has the very effective electric contact by each projected part 9A.

[0013] in addition, form apical surface 8c of said probe needle 8 to become the front face of pad 1a, and parallel if possible, and excite said projected parts 9 and 9A — it is desirable to constitute so that it may be projected and carried out in the direction where the center line of **** is perpendicular to this apical surface 8c, i.e., the direction in which the probe needle 8 and pad 1a are contacted. Consequently, as for the cross-section configuration of each projected parts 9 and 9A, it is desirable to be formed in serrate [which was biased by one side to said apical surface 8c]. Thereby, each projected parts 9 and 9A will be perpendicularly contacted to the front face of pad 1a, attach an oxide film more effectively, and tear it, and the suitable electric contact of them is attained.

[0014] In addition, said operation gestalt can show an example of this invention, and the configuration of the projected part arranged especially in the apical surface of a probe needle can apply various configurations in addition to the configuration which described the array gestalt above.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the outline block diagram of the important section of a circuit tester with which the probe card of this invention is applied.

[Drawing 2] It is the expansion perspective view of the point of the probe needle concerning this invention.

[Drawing 3] It is the sectional view showing the contact condition of the probe needle of drawing 2 , and a pad.

[Drawing 4] It is the perspective view and the sectional view of a contact condition of the point of the probe needle of the conventional probe card.

[Drawing 5] It is the perspective view and the sectional view of a contact condition of the point of the probe needle in the probe card with which the former has been improved.

[Drawing 6] It is the perspective view and the sectional view of a contact condition of the point of the probe needle in the probe card with which everything but the former has been improved.

[Description of Notations]

1 IC

2 Stage

3 Vertical Drive

5 Probe Card

6 Insulating Substrate

7 Circuit Pattern

8 Probe Needle

8b Point

8c Apical surface

9 9A Projected part

[Translation done.]

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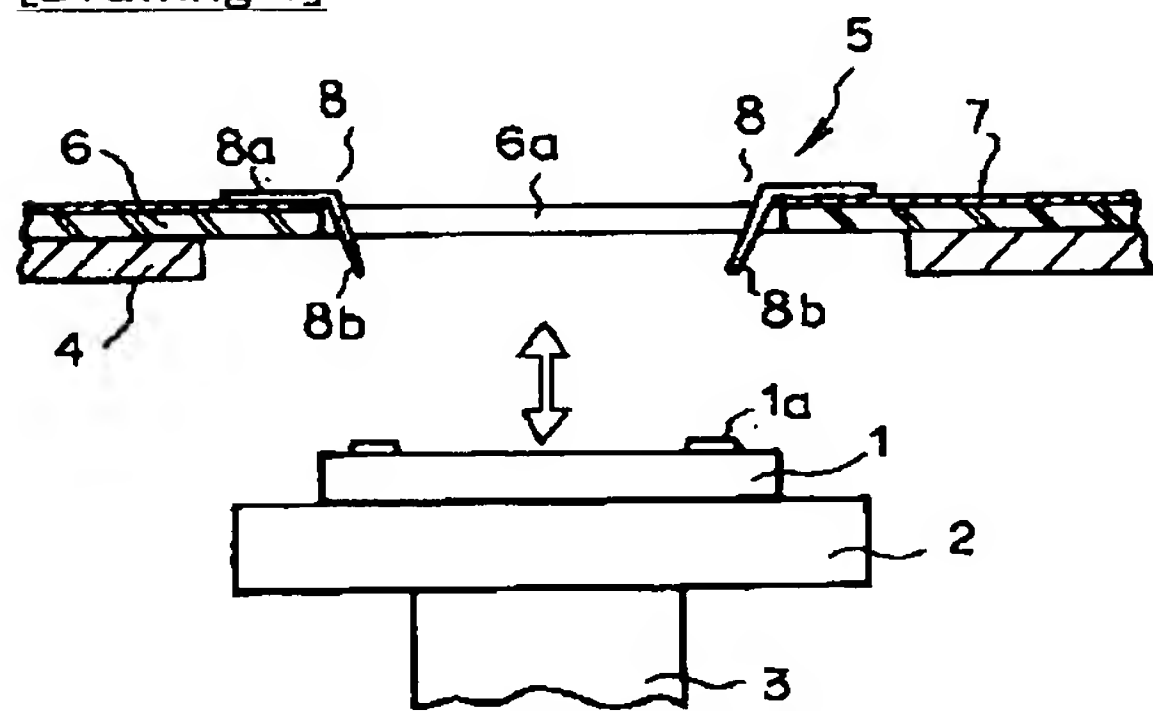
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DRAWINGS

[Drawing 1]



1 : IC (半導体集積回路装置)

1a : パッド

2 : ステージ

3 : 上下駆動機構

4 : 固定ボード

5 : プローブカード

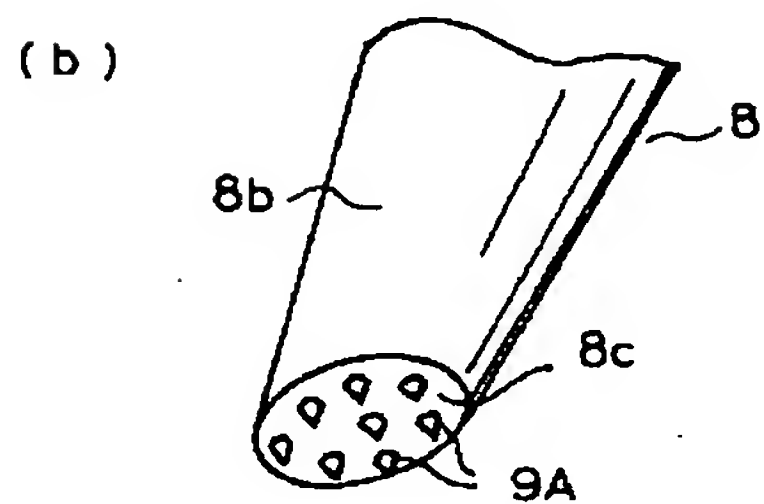
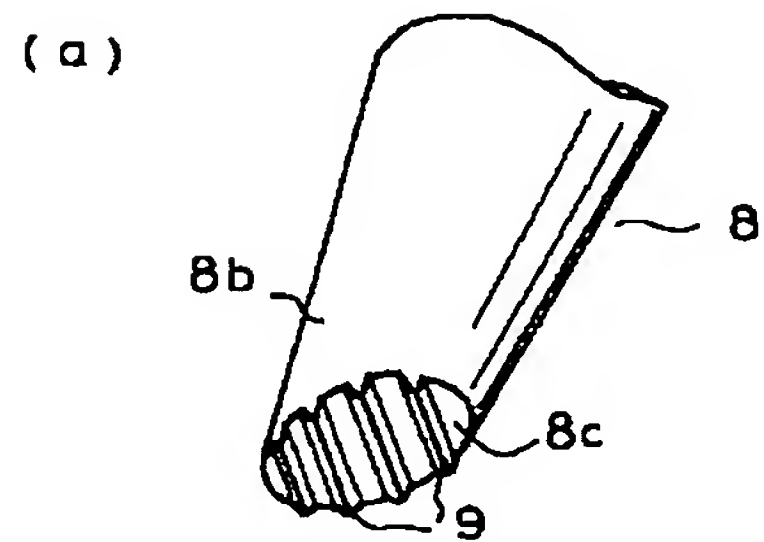
6 : 絶縁基板

7 : 回路パターン

8 : プローブ針

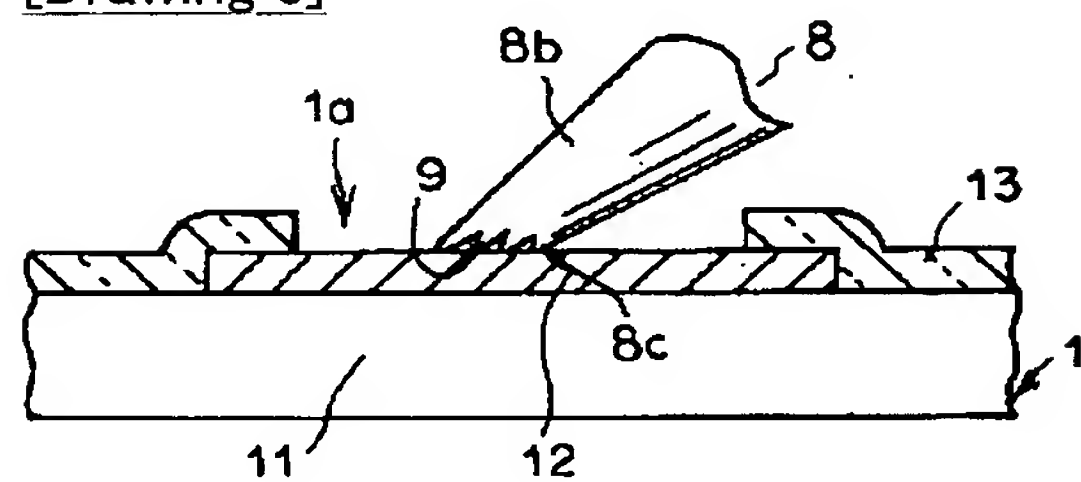
8b : 先端部

[Drawing 2]



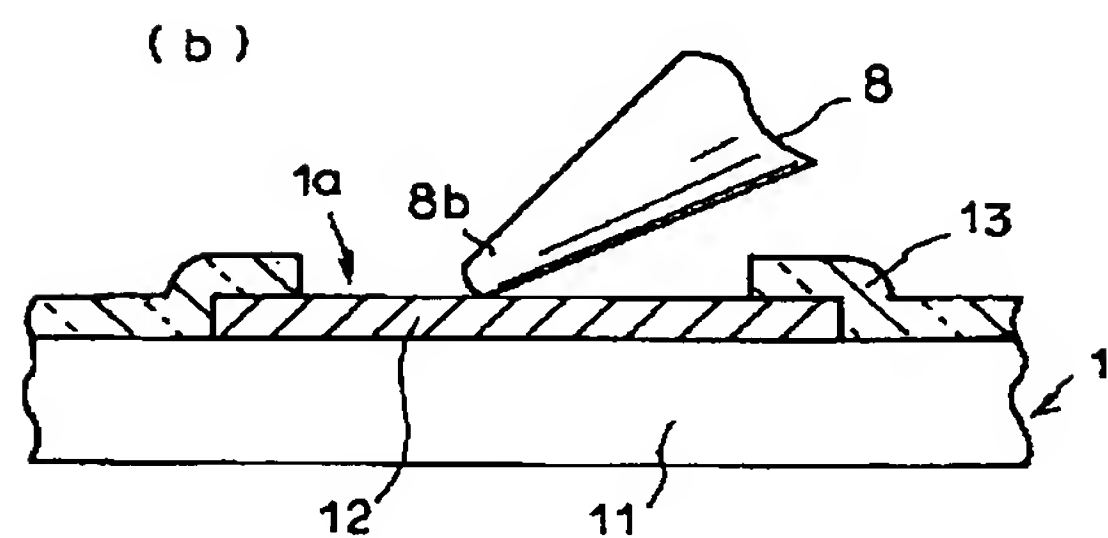
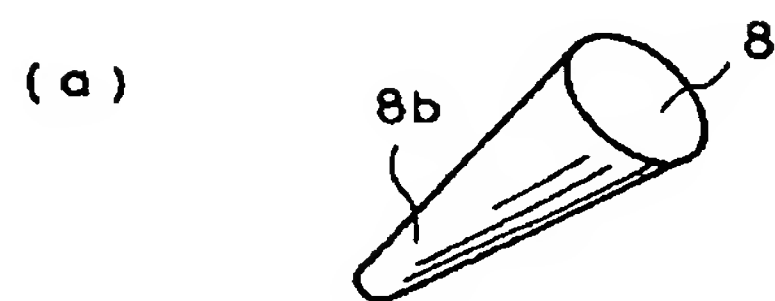
8 : プロブ針
 8b : 先端部
 8c : 先端面
 9 : 突部 (格子状)
 9A : 突部 (円錐状)

[Drawing 3]



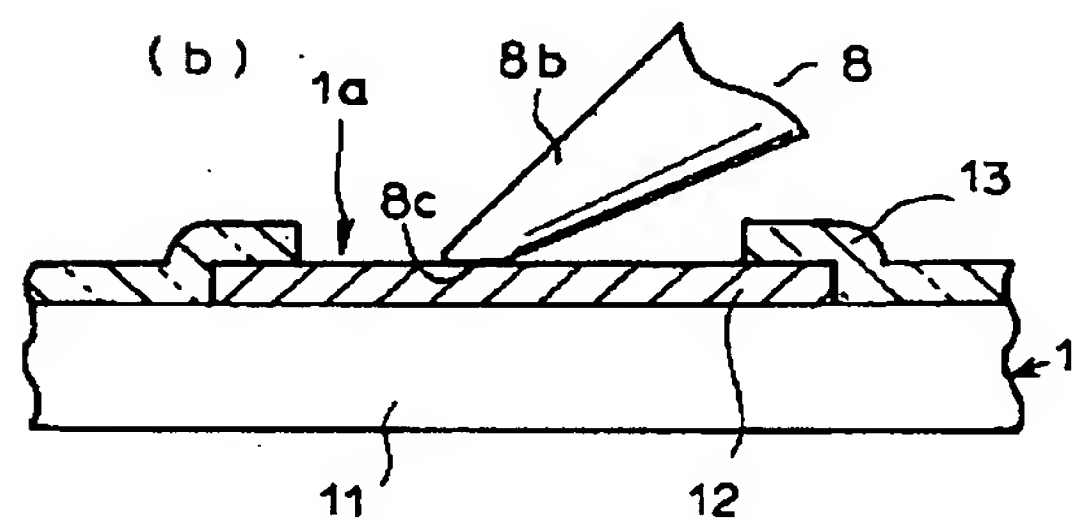
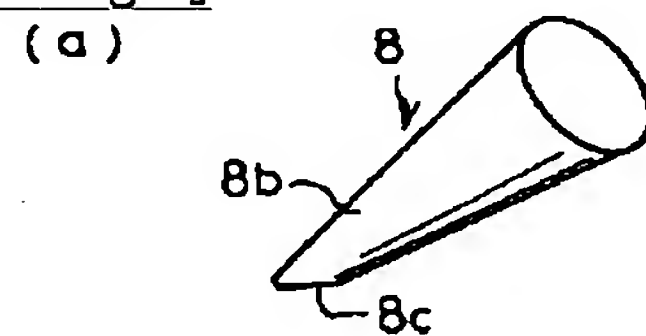
1 : IC
 1a : パッド
 11 : 基板
 12 : 導電膜
 13 : 保護膜
 8 : プロブ針
 9 : 突部

[Drawing 4]



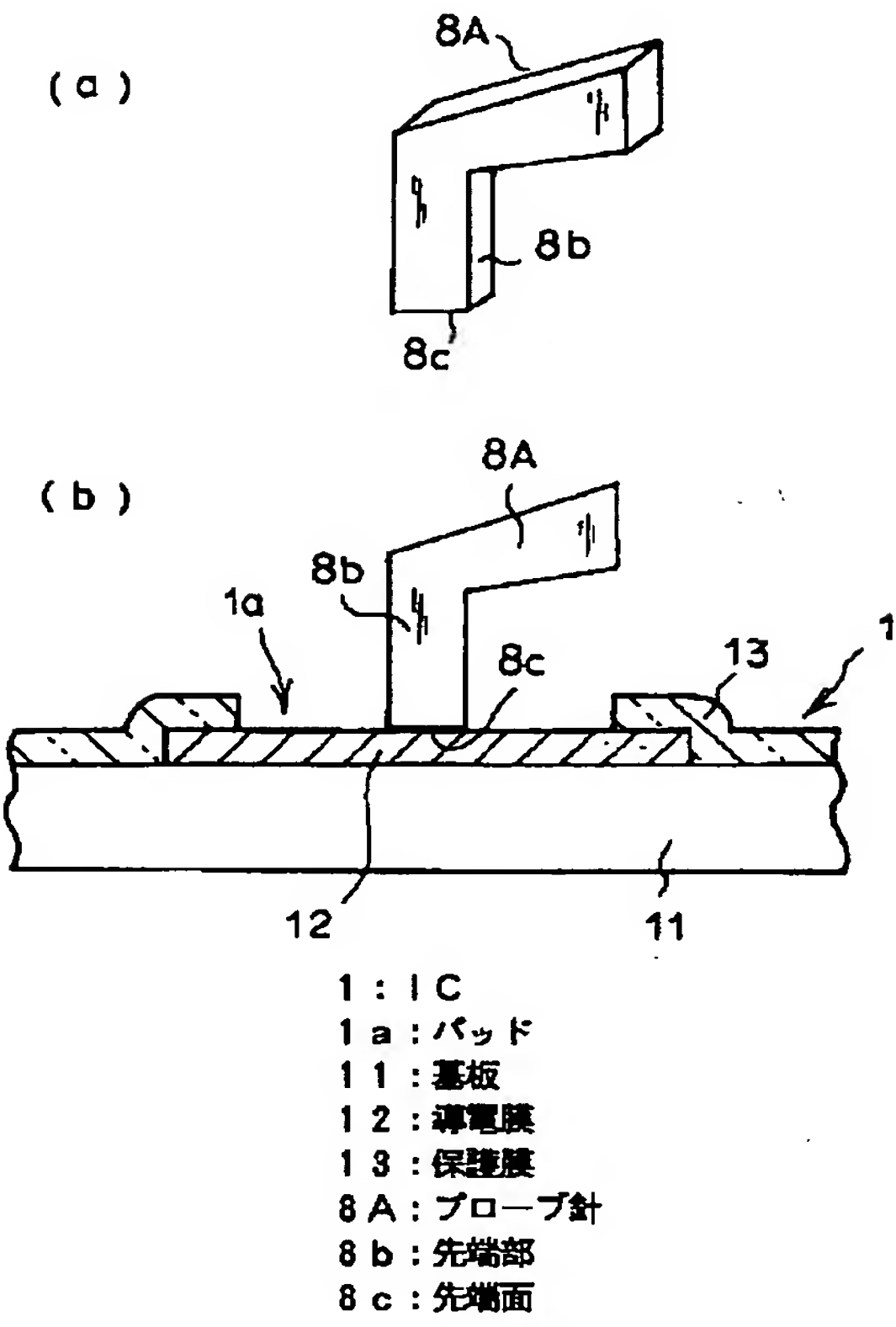
1 : IC
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 12 : 導電膜
 13 : 保護膜
 8 : プローブ針
 8b : 先端部

[Drawing 5]



1 : IC
 1a : パッド
 11 : 基板
 12 : 導電膜
 13 : 保護膜
 8 : プローブ針
 8b : 先端部
 8c : 先端面

[Drawing 6]



[Translation done.]